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Metabolic Change Unit Summation for Sugar Beet Germination

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1. The development of a real-time model for the progress of virus yellows on the Sugar Beet crop requires complimentary information on the crop and the vector.

2. Fornstrom and Pochop (1974) present an emergence-temperature model for sugar beet, in which basic information on germination period, from laboratory studies at constant temperature, is in the form of a linear curve on log-log coordinate; the variates are "Days to 50% emergence" and "Temperature excess (for the soil) above a base of 40°F.

3. Reading information from their graph, we obtain the following table 1.

Table 1

Days to 50% emergence of sugar beet as a function of soil temperature.

Temperature °F	Days to 50% emergence
48	15
50	13
55	8.5
60	7
65	6
70	5

4. If metabolic change units are calculated for these data, from a base of 45°F and with a Q_{10} of 1.5, (Fahrenheit degrees being retained for simplicity), then the date of Table 2 result. Day degrees accumulations above 45°F are included for comparison.

Table 2

Metabolic change unit accumulations for the data of Table 1.

Temperature °F	Days to 50% emergence	Metabolic Change Units/Kb	Day Degree Units
48	15	15.7	45
50	13	14.9	65
55	8.5	12.7	85
60	7	13.1	105
65	6	13.5	120
70	5	14.0	125
	Mean	14.0	
	Standard Deviation	1.0	

We note (as in Ag. Mem. 696) the tendency for Metabolic Change Units calculated for temperatures close to the lower threshold to require a low Q_{10} value for greater consistency with the general run of observations.

For practical purposes, it would appear that a constant Metabolic Change Unit summation might be adopted for the germination phase of the sugar beet crop, given that soil moisture is never limiting.

5. This note gives one further example of the general applicability of the Metabolic Change unit approach, this time for phases of plant development, as distinct from insects and fish.

Reference

Fornstrom, J K 1974 Trans. ASAE
Pochop, L O Vol. 17, No.4 pp.761 764